12. Mirov, N. T. Composition of gum turpentines of pines, XIV. A report on Pinus ayacahuite, P. cembroides and P. pinceana. Jour. Am. Pharm. Assoc. Sci. Ed. 41:673–676. 1952.
13. ———— Composition of gum turpentines of pines, XV. A report on Pinus resinosa and P. reflexa. Jour. Am. Pharm. Assoc. Sci. Ed. 41:677–679. 1952.
14. Pentegov, A. P. and S. V. Netupskaia. Gum turpentine of Siberian pine. Compt. Rend. Acad. U.R.S.S. 1:119–122. 1950.
15. Rydberg, P. A. Flora of the Rocky Mountains. New York. 1917.
16. Sargent, C. S. Notes upon some North American trees, XIV. Garden and Forest 2:469. 1889.
17. Schorger, A. W. Contributions to the chemistry of American conifers. Wisc. Acad. Sciences, Arts and Letters 19 (2): 728–766. 1919. (Also reference 19, p. 24.)
18. ———— The oleoresins of Jeffrey and singleleaf pines. Jour. Ind. Eng. Chem. 5:971–973. 1913.
19. ———— An examination of the oleoresins of some western pines. U.S. Dept. Agr., For. Serv. Bull. 119, p. 28. 1913.
20. Shaw, G. R. The pines of Mexico. Publ. Arnold Arb. No. 1. Boston, Mass. 1909.
21. The Genus Pinus. Publ. Arnold Arb. No. 5. Cambridge, Mass. 96 pp. Ill. 1914.
22. Simonsen, J. L. The essential oil from oleo-resin of Pinus gerardiana Wall. Indian Forest Record 9 (10):345–348. 1923.
23. Simonsen, J. L. and M. G. Rau. The essential oil from oleo-resin of Pinus excelsa. Indian Forest Records 9(4):116–122. 1922.
24. Sudworth, G. B. The pine trees of the Rocky Mountain region. U.S. Dept. Agr. Bull. No. 460, 46 pp. 1917.
25. ———— Check list of the forest trees of the United States. U.S. Dept. Agr. Misc. Cir. No. 92. 1927.

A NEW SPECIES OF CLARKIA (ONAGRACEAE)

Harlan Lewis and W. R. Ernst

Clarkia similis sp. nov. Herba erecta altitudine ad 9 dm.; caulibus simplicibus vel ramosis; foliis angusto-lanceolatis vel elliptis, denticulatis, 2–4 cm. longis, 3–8 mm. latis, in basi ad petiolos usque ad 8 mm. longo angustatis; inflorescentium axe in apice recurvato; calycis tubo 1.5–2 mm. longo, annulo pilorum ad apicem posito, limbo 6–10 mm. longo, circiter 1.5 mm. lato; petalis 6–12 mm. longis, 3–6 mm. latis, oblanceolatis vel rhomboideis vel obovatis subintegris, acutis vel rotundatis, in basi in unguiculum gracilis circiter 1 mm. longum angustatis, albis vel pallidis in parte inferior purpureo-punctulatis; staminibus 8, plerumque ab stigmate liberis; stigmate quadrifido, lobis brevibus; stylo aequante stamines; ovario 8-canaliculato, 1.5–2.5 cm. longo; capsula 1.5–3 cm. longa, 1–1.5 mm. lata.

Erect herb as much as 9 dm. tall; stems simple or branched, puberulent above with short upwardly curled hairs sometimes sparsely so, sparsely puberulent to glabrate below; leaf blades narrowly lanceolate to lanceolate-elliptic, subentire to denticulate, 2–4 cm. long, 3–8 mm. broad, the apex often obtuse, glabrate to sparsely puberulent, narrowed into petioles as much

as 8 mm. long; rachis of the inflorescence reflexed in bud becoming erect as the flowers open; buds pendulous; hypanthium 1.5–2 mm. long, puberulent, the ring of hairs at the upper margin; sepals lanceolate 6–10 mm. long, about 1.5 mm. broad; petals 6–12 mm. long, 3–6 mm. broad, oblanceolate to rhomboid or obovate, subentire, the apex rounded, acute or undulate, narrowed at the base to a slender claw about 1 mm. long, nearly white to light pink shading to white below, flecked with purple in the lower half; stamens 8, in two series, the outer longer, both series with yellowish pollen; anthers usually free from the stigma; stigma whitish with 4 short lobes; style pinkish, equaling the stamens; ovary subterete, 8-striate, 1.5–2.5 cm. long, sessile or on pedicels as much as 3 mm. long; mature capsules quadrangular 1.5–3 cm. long, 1–1.5 mm. broad.

Type. 7.6 miles west of Ramona, San Diego County, California, April 22, 1951, *Lewis, Lewis, Ernst and Mathias 773* (UCLA).

Distribution. California: Fresno, Los Angeles, Orange, Riverside, San Benito, San Bernardino and San Diego counties. Probably also in northern Baja California.

Specimens examined. Fresno County: 12 miles from Coalinga on the road to Parkfield, *Eastwood and Howell* in 1938. Los Angeles County: Wolfskill Canyon off San Dimas Canyon, *Ewan 2376;* East Fork of Big Santa Anita Canyon, San Gabriel Mountains, *Howell 3777.* Orange County: Santa Ana Mountains, San Juan Canyon, 0.2 mile west of Upper San Juan Camp Ground, *Lewis, Lewis, Ernst & Mathias 769,* Santa Ana, *Smith* in 1930. Riverside County: Cranston Ranger Station, San Jacinto Canyon, without collector in 1951; Banning, *Gilman 23;* 10 miles south of Hemet, *Munz 10816;* Elsinore, *McClatchie* in 1892; San Juan Mountains, San Juan Canyon, *Winblad* in 1941. San Benito County: Pinnacles, *Howell 12936.* San Bernardino County: Arrowhead Hot Springs, *Grant 6617;* mountain slopes, Clear Creek road, *Parish* in 1891; San Diego County: *Cooper 531; Henshaw 27;* San Diego, *T. S. Brandegee* in 1903; top of the grade, Descanso, *K. Brandegee* in 1906; Fallbrook, *Cleveland* in 1981 (sic!); Ramona, *Collins and Kempton 159;* Warner's Springs, *Coombs* in 1911; Tia Juana, *Eastwood 2929;* South Fork Featherstone Creek, Barona Valley, *Gander 4015;* 3 miles south of Deluz, *Gander 5793;* Burn between Campo and Canyon City, *Gander 9346;* 5 miles south of Mesa Grande, on Black Canyon Road, *Gander 11356;* San Diego, *Grant 88;* Potrero Grade, *Gray* in 1925; San Ysabel, *Henshaw* in 1893; San Felipe Creek, *Keck and McCully 111;* 7.6 miles west of Ramona, *Lewis, Lewis, Ernst and Mathias 773* (type); Banner Grade below Julian, *Munz and Hitchcock 11363.*

The haploid chromosome number is 17. Material from the type collection has not been counted. The count is based

upon examination of pollen mother cells of the following collections: Orange County: Santa Ana Mountains, San Juan Canyon, 0.2 mile west of Upper San Juan Camp Ground, *Lewis, Lewis, Ernst and Mathias 769.* San Benito County: High Peaks Trail, Pinnacles National Monument, *Lewis and Epling 787* (approximately 17 pairs, no definite count). San Diego County: 0.4 mile east of Cleveland National Forest boundary on road to Barret Lake, *Lewis and Lewis 277;* 2.1 miles east of Cleveland National Forest boundary on road to Barret Lake, *Lewis and Lewis 280;* Campo to Potrero road between culverts D 8.07 and D 8.14, *Lewis and Lewis 288A.* Permanent slides and herbarium vouchers are on file at the University of California, Los Angeles.

Clarkia similis is a tetraploid species (n=17) which on morphological grounds is most closely related to *Clarkia modesta* Jeps. (n=8) and *Clarkia epilobioides* (Nutt.) Nels. & Macbr. (n=9) and probably represents an allopolyploid derived from them. The nature of the chromosome pairing in the hybrid *C. modesta* × *C. similis* and that of the hybrid *C. epilobioides* × *C. similis* leaves very little doubt that this hypothesis is correct. The hybrid between *C. modesta* and *C. epilobioides* is morphologically similar to *C. similis.*

Clarkia modesta, C. epilobioides and *C. similis* are morphologically so similar that Hitchcock (revision of North American species of *Godetia.* Bot. Gaz. 89:321–361. 1930) included all of them within a single species (*Godetia epilobioides*) without even subspecific recognition. The reason is not difficult to find. All three species are very similar vegetatively and differ primarily in the color and conformation of the corolla. The flowers of *C. epilobioides* are uniformly bright white or somewhat yellowish, often pink in age. The petals are obovate and uniformly arranged forming a regular corolla. The petals of *C. modesta* on the other hand are oblanceolate or somewhat rhomboid, pink, usually with darker flecks in the lower half, and are usually not equally spaced but are arranged in lateral pairs. The petals of *C. similis* are more or less intermediate, usually pale pink or sometimes nearly white and normally flecked. The petals are more variable in shape than in either diploid species and the flowers are usually somewhat irregular. Viewed only from herbarium sheets, without knowledge of the chromosome complements, the three species present a complex picture suggesting continuous variation in a single polytypic species. However, once the basis of genetic discontinuity is apparent the morphological discontinuity between living populations becomes obvious, particularly where two of the species are found growing together.

The distribution of *C. similis* between southern California and the Pinnacles region in San Benito County is apparently disjunct. It is uncertain at present whether these two races,

which differ somewhat morphologically, represent independent origins of the allopolyploid or segregation from a once continuous distribution. *Clarkia epilobioides,* but not *C. modesta,* often occurs with *C. similis* in southern California. Both diploids are found in the area of *C. similis* in San Benito County.

Acknowledgements

The authors wish to acknowledge the loan of herbarium material from the following institutions: San Diego Museum of Natural History, California Academy of Sciences, Dudley Herbarium of Stanford University, Pomona College, University of California at Berkeley, Missouri Botanical Garden, United States National Herbarium, New York Botanical Garden and Gray Herbarium.

We are indebted to Professor Carl Epling for assistance with the Latin diagnosis.

Department of Botany,
University of California, Los Angeles.

MORPHOLOGICAL CRITERIA FOR THE SPECIFIC VALIDITY OF PINUS JEFFREYI

Donald A. Johansen

The validity of *Pinus jeffreyi* Murr. as a distinct species has long been in dispute among taxonomists. Some (1, 2, 3, 7) recognize it as distinct; others consider it to be a variety of *P. ponderosa* Dougl. (5, 9); while still others give it no recognition whatever (10, 11). Those who reduce *P. jeffreyi* to varietal rank have apparently been disturbed by the fact that "intermediate" or "intergrading" forms are rather common in certain regions where the two species or others occur more or less intermingled. It was not until comparatively recently that it came to be realized that these "intergrades" are actually natural hybrids. Several such hybrids have been experimentally produced (4, and personal communications from Dr. Duffield).

Mirov (8) accepted the distinction between the two species on biochemical grounds and concluded that *P. jeffreyi* is phylogenetically older than *P. ponderosa.* In the latter conclusion, he agrees with the opinion of Lemmon (6).

For several years the writer has been conducting an intensive and extensive investigation of archegoniogenesis in the genus *Pinus* and other gymnosperms. Among other results, it was ascertained that the account of events within the archegonium, which has prevailed for the past fifty years, was incomplete. This story actually concerns only the almost entirely modern, evolved archegonium in a single species (the so-called